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**AIR FORCE MISSILE DEVELOPMENT CENTER
TECHNICAL REPORT**

A SPATIALLY CONTIGUOUS STIMULUS-RESPONSE
APPARATUS FOR PRIMATES

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Marvin E. Grunzke



**HOLLOMAN AIR FORCE BASE
NEW MEXICO**

October 1961

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A SPATIALLY CONTIGUOUS STIMULUS-RESPONSE
APPARATUS FOR PRIMATES

by

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AIR FORCE MISSILE DEVELOPMENT CENTER
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
Holloman Air Force Base, New Mexico

October 1961

ABSTRACT

This report describes a stimulus-response device for primates in which the response manipulandum and stimulus cue are combined into a single unit. Considerable success has been obtained with this device in cognitive learning problems.

PUBLICATION REVIEW

This Technical Report has been reviewed and is approved.



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A SPATIALLY CONTIGUOUS STIMULUS-RESPONSE APPARATUS FOR PRIMATES

It is generally agreed that contiguity in space between the stimulus cue and associated response manipulandum is an important factor in training animals on any type of a discrimination problem. This paper describes a device in which the response manipulandum, a transparent push-button, is mounted directly in front of a visual stimulus to provide an integrated unit in which no spatial differences exist.

A cut-away drawing in Figure 1 shows four of these units mounted on the wall of a primate test chamber. An In-line Digital Display* (IDD) is used in each unit to present the stimuli (Ref. 1). Each unit can present 12 stimuli, either individually or in combination, consisting of letters, figures, or hues. The latter are specified by Wratten filters. A common lead attached in parallel to the 12 lamps and separate leads to each lamp permits individual or combined presentation of each stimulus.

The response manipulandum consists of a 0.25 inch of clear lucite plate which is mounted by means of four bolts immediately in front of the IDD. A spring requiring 0.15 ounce for compression is mounted on each bolt; these keep the lucite plate approximately 0.375 inch in front of the IDD screen. Pushing the plate compresses the springs and permits it to move against the display screen. This response activates two microswitches by means of a cam which is attached to the back of one of the lucite plate mounting bolts. The first of these switches (A) is closed when the lucite plate is completely depressed and a 24-volt D. C. connected to the common terminal will appear at the "normally open" contact; this can be routed to a pulse former or other programming component.

The second microswitch (B) is activated when the lucite plate is not depressed and is released during the initial stage of travel of the manipulandum. Upon this release, a 24-volt D.C. which is routed

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* The In-line Digital Display is manufactured by Industrial Electronic Engineers, Inc., 5528 Vineland Avenue, North Hollywood, California (Price: \$17.00); this unit is also used in the Grason-Stadler Company Multiple Stimulus Projector, E4580.

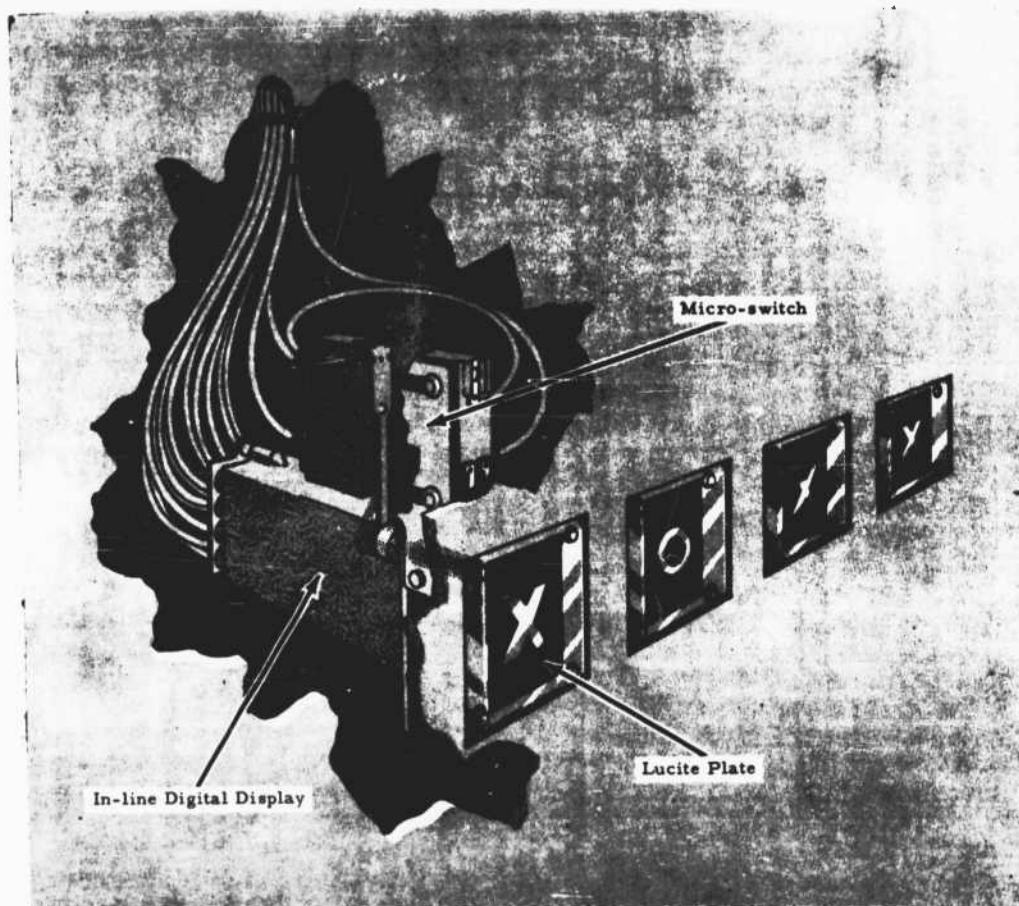


Figure 1. Stimulus-Response Device

Centered 4 inches below the devices was a well for receiving food pellets. A Davis pellet feeder was used and 97 milligram Noyes pellets served as the reward. Programming was accomplished by automatic operant conditioning equipment and responses were recorded on cumulative recorders.

via the common terminal will appear at the "normally closed" terminal. This switching arrangement provides a method for handling simultaneous responses on two or more levers. The pulses from both microswitches in each unit are coded on the program rack as "correct" or "incorrect". The "incorrects" from the (B) microswitches are used to program a time delay or punishment sequence while the "corrects" from the (A) microswitches are used to present reinforcements. With the "incorrects" occurring during the initial movement of the manipulandum and the "corrects" at the termination of movement, all dual responses (which could consist of a right and a wrong) will be resolved as "incorrect" since the punishment sequence will be effected early enough in the sequence to nullify the action of the "corrects" pulse.

² This apparatus has been used successfully in this laboratory with monkeys and chimpanzees, and Strong (Ref. 2)* in testing this unit for this laboratory, has reported a significantly higher acquisition rate with this apparatus than with devices employing the typical lever beneath the stimulus light combination.

* Research supported by Air Force Contract No. AF 29(600)-2418.

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2. Strong, P. N. , "Oddity Solution and Transfer as a Function of Trials per Problem and Apparatus, " Paper read at Am. Psychol. Ass. , New York, September, 1961.

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